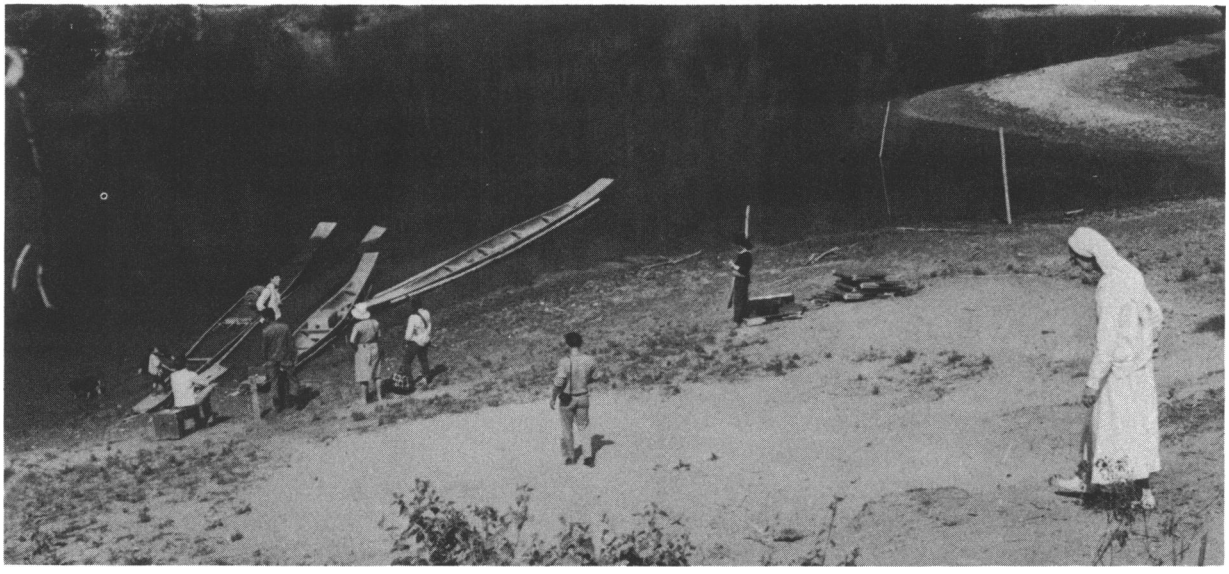

University of Hawaii's survey team prepares to embark upon the Mekong River in native canoes

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HEALTH SURVEY ALONG THE MEKONG RIVER

Despite intermittent warfare, primitive transportation methods, and the need for interpreters when communicating with the native population, a team from the University of Hawaii School of Public Health completed an extensive health survey of Laotian villages in the Mekong River Valley in 1968–69.

The Royal Laotian Government and the Thomas A. Dooley Foundation cooperated in the survey. Emmanuel Voulgaropoulos, University of Hawaii professor of public health, helped plan and direct the survey. He was one of the founders and is currently a director of the Dooley Foundation—the outgrowth of work the late Thomas Dooley of the United States began in Indochina during the 1950's. Gail Breakey, who earned her master's degree in public health at the University of Hawaii, managed the team's field operations.

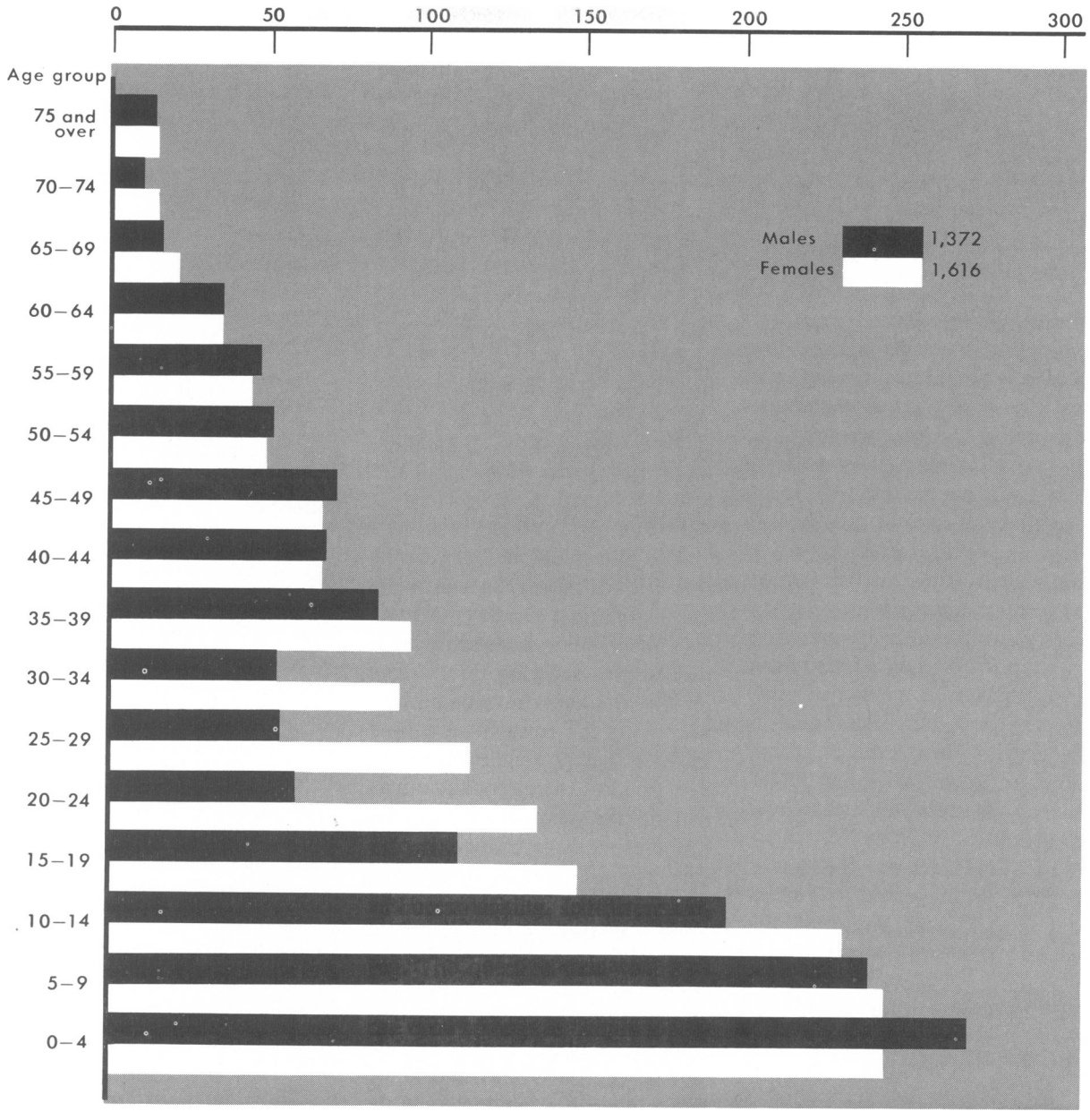
Survey Objectives

The survey was conducted for several purposes. Baseline data from it would help the Dooley Foundation in measuring the effectiveness of its Laotian programs, and training courses in public health could be established by the foundation to meet the country's health needs, which would be revealed by the survey. Long-range planning also could be initiated to meet future health problems in the villages.

The survey was restricted to the Mekong River Valley because it appeared to be the area least threatened by the military upheaval in and around Laos.


CHINA
Mekong R.
LAOS
VIETNAM
South
China
Sea
Mekong River
THAILAND
CAMBODIA

Distribution of sample population, by age and sex



The Mekong River offers a good mode of transportation, and approximately 75 percent of Laos' inhabitants live on or near it, so the sample could be drawn from the majority of the population.

Conducted from mid-September 1968 through September 1, 1969, the survey involved 15 villages along the river and 2,988 persons (see map and chart). The survey team developed a detailed procedure for sampling these villages, but once the group began working it became apparent that they could not select villages randomly because of security problems. Consequently, they surveyed the villages that appeared to be as representative as possible of rural Laos and which were most secure from military hostilities.

The survey workers were persistently frustrated by security measures because of guerilla warfare operations in the area. At

one point the situation became so serious that the team halted its activities for several months. Then, because security measures began deteriorating during the summer and some team members had other commitments, the survey was terminated September 1, 1969. Despite all handicaps, the survey team amassed a sizable quantity of data for an accurate health profile of the Laotians living on or near the Mekong River.

Animistic Beliefs

All ethnic groups in Laos have held certain animistic beliefs that are closely related to their ideas concerning health, welfare, and disease. Basically, they believed that each person has 32 spirits and that the state or condition of these spirits directly affects a person's well-being. If the spirits leave the body, they may cause a person to become ill; therefore, they must be exhorted to return. If other spirits enter the body, they cause illness and must be banished. Most ethnic groups, however, have seemed willing to accept Western medical treatment.

Few villagers in the survey population expressed an understanding of germs. Some said that because they were now Catholics they did not believe in evil spirits but attributed disease to bad food, the weather, or mere chance.

Instructors and nurses at a hospital in Sam Thong, Plain de Jarres, also were interviewed. The instructors said that only one or two of the 30 student nurses actually comprehended the germ theory or sterilization techniques, and the remainder performed by rote.

Infant Mortality

The indicated infant mortality ratio in Laos was about 150 per 1,000 live births, with roughly 50 percent of the infants surviving into childhood. Parents indicated that five was the desired number of children. Few women knew of any birth control means although 24 percent were interested in learning about the various techniques.

The desired number of children (five) equals the survival rate in Laos; which means that twice as many children must be born to a family to have five survive into childhood. The information gathered indicated that a high proportion of infant mortality in Laos has resulted from a complex interaction of malnutrition, diarrhea, and pneumonia.

Nutrition and Diets

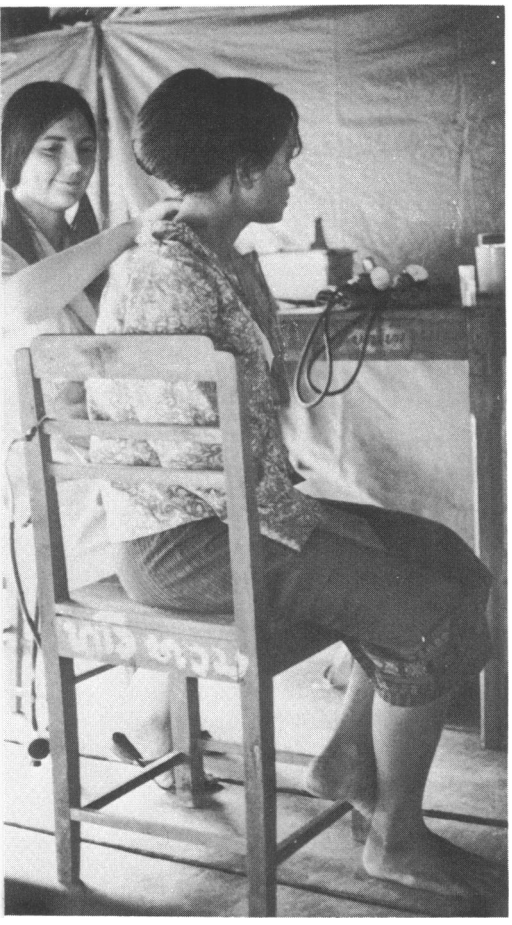
The nutritional findings of the survey have been reported in detail elsewhere (*1*). Briefly, however, one important goal accomplished was securing information on the Laotians' nutritional status. Using the Iowa Standard—a table of heights and weights by age groups—to determine malnutrition, the surveyors found that 30 percent of the children 0 to 1 year and 11 months, 50 percent of those 2 to 3 years old, and 55 percent of those 4 to 5 years old were below standard weight as compared with American children of similar ages. The percentages tended to be greater among rural villagers and those living in refugee villages. In addition, the survey team observed instances of illness as a result of vitamin A deficiency: Bitot's spots, keratomalacia, and blindness.

For food and dietary findings, the actual 24-hour intake per household had to be noted and the data evaluated both for nutrient content and amount of food groups consumed. The survey team recognized that 24-hour recall is a crude technique, but the large sample and wide seasonal variation in sampling increased its credibility. They allowed for the possibility of error and underreporting and considered their findings as minimal estimates.

Most Laotians use glutinous rice for the bulk of their diet, supplementing it with fish, garden vegetables, fruits, berries, and such foraged items as leaves, roots, and seeds. They do not consume dairy products, and few eat eggs. Meat is eaten infrequently, and even though the Laotians raise vegetables, they do not consume them in great quantities.

All but 12 sample households had intakes of vitamin A below recommended levels, and 94 percent of the total fell below 50 percent of the recommended allowance. In every sample village, from 90 to 100 percent of the households fell below the recommended allowance for riboflavin —probably caused by the absence of garden greens, yellow fruits, and other vegetables. Intakes of calcium and iron were considerably below recommended standards, and some deficiencies of thiamine and niacin were recorded. Caloric intake was inadequate in all villages. The intake of protein was adequate, but because of low caloric intake the protein consumed probably was being used to supply energy.

Some major effects of malnutrition on the people of a country like Laos are general apathy and lack of vigor, with a subsequent decrease in their economic productivity. "Laotian villagers," one survey team member observed, "while hard-working during planting and harvest seasons, are



University of Hawaii survey team member checks a Laotian woman for schistosomiasis

generally not an energetic people. This characteristic is usually ascribed to culture, but it may be partly due to lack of energy because of an inadequate diet."

Snail-Host Disease

Another major goal of the survey was evaluating the threat of schistosomiasis in the Mekong River Valley. A 1967 study by the World Health Organization (*2*) revealed that the focal point of schistosomiasis is in southern Laos near Khong Island.

The survey team screened the population for schistosomiasis infection by intradermal testing. They used Melcher antigen, standardized to 10 mg. protein per 100 ml., with distilled water as the diluent. The control solution was buffered saline with merthiolate 1:1,000. Both substances were injected in the person's back, and the test results were read 15 minutes later. Stool specimens collected from all persons with wheal indurations of 7 mm. or more were examined for schistosome ova as well as for other ova and parasites. To rule out false positives, the wheal from the antigen had to be at least twice as big as the wheal from the control solution.

In a village directly across the river from Khong Island, a total of 38 percent of the inhabitants had positive skin tests, while 20 percent of the inhabitants of a village 12 kilometers downstream had positive skin tests. Cross-tabulations were made for persons with an enlarged spleen because this condition can indicate either malaria or schistosomiasis. Of 91 enlarged spleens, 21 were associated with malaria.

Health officials fear that the spread of schistosomiasis-transmitting snails will be greatly accelerated when some large hydroelectric and irrigation dams on the river are constructed in the United Nations-backed Mekong Valley Development Project. Several of these dams are scheduled for completion within this decade. The subsequent backup of water will form large lakes, making it much easier for snails to be transported to sections of the country that presently are not infected. A similar spread occurred in Egypt after the Aswan Dam was completed. The snail host was dispersed over large sections of that country, which previously had not been bothered by the disease.

Environmental Sanitation

The survey team observed sanitary conditions and practices in each sample village. They concluded that a principal cause of disease in Laos was related to water sources and storage. Depending on their residence, the Laotians obtained water for cooking and drinking from the Mekong River, its tributary streams, rainwater catchments, shallow seasonal wells, or shaft wells and centralized tower systems that draw from a well. The only sources that did not appear grossly contaminated were the newer, covered-cement ring wells with pumps and water tower systems, although they could not be considered as entirely safe because the water was untreated.

The other sources were subject to gross contamination by surface runoff and ground water containing human and animal feces. Even well water obtained by lifting a bucket with a rope was subject to contamination if the bucket was set down on contaminated ground before being dipped in the water. In addition, the availability of relatively "safe" well water did not necessarily mean it would be used for drinking because factors such as the taste and distance it must be carried influenced the villagers' use of it.

Each person examined was questioned concerning a history of bloody stools—a strong indication of amoebic dysentery. A total of 155 persons, or 5.2 percent of the total sample, responded positively, but no specimens sampled demonstrated amoeba.

Routine blood examinations with Lederle's *Salmonella* D–O antigen and the heparinized hematocrit tube technique were performed on each person to

detect traces of typhoid. Four village populations showed a range of positive titers from 33 to 44 percent, but the average for all sample village populations was 21.5 percent. Another estimated 20 percent of the total sample population had weak reactions to the antigen.

The Royal Laotian Government conducted typhoid-cholera immunizations in widespread areas during 1966, and most river-village residents were reported to be inoculated. The survey team's findings indicated that most of the positive reactions it detected were due to recent infection rather than previous inoculations. Nearly half of the positive readings were for children aged 5 to 19. Studies of cholera and hepatitis were not part of the survey as it would have been difficult to carry out mass screening for these diseases.

Diseases Among Villagers

Soil contamination diseases. Stool specimens obtained from a subsample of children aged 3, 6, 9, and 12 years were examined for various intestinal parasites. Ascaris had the highest prevalence, with a rate of 38.5 percent. In one village 30 percent of the specimens were positive for hookworm, and there seemed to be a direct correlation between villages with low hematocrits and high infestations of hookworm. The prevalence of parasitic diseases from eating raw foods appeared to be low and a minor health problem except in a few villages where *Opisthorchis viverrini,* or flukes, are found.

Mosquito-borne diseases. The prevalence of malaria ranged from 11 to 31 percent in refugee villages and from 1 to 7 percent in urban and rural villages. Each villager was examined for enlargement of the liver and spleen, and tests for filariasis were conducted with negative results.

Respiratory diseases. Incidence of tuberculosis in Laos was unusually low. The areas of highest incidence occurred in urban villages, where the rate, as determined by X-ray, was 4 to 8 percent. The survey team assumed that the reason was Laos' low population density and relative isolation from the outside world.

Tests for tuberculosis included physical examination for signs of congestion and the presence of a BCG (bacille Calmette Guérin) scar. Each person was questioned about a history of bloody sputum. PPD–S (purified protein derivative–S) intermediate antigen was injected in each person, and in four villages paired testings were conducted by using the tine test, with 5 international tuberculin units injected in one arm and PPD–S in the other.

Positive skin tests were noted in 14 percent of the families where one person had a positive X-ray, while only 6 percent was noted among the general population. The rate of positive cases found by X-ray in the general sample population was 1.1 percent; less than half were read as active or possibly active tuberculosis.

Smallpox. There was slight prevalence of this disease in Laos, and only five persons had facial pockmarks. A total of 71.6 percent of the villagers had smallpox vaccinations although only 51 percent of children under 9 years of age had been vaccinated.

Contact diseases. Symptoms of leprosy appeared in 38 persons examined during the survey. Each participant was examined for skin anesthesia and other symptoms of the disease, but because team members could not get all villagers to disrobe completely, they may have missed early signs such as lesions on the buttocks. Laotian officials and churchmen indicated that it was common practice to remove from a village any person who exhibited signs of leprosy, which may have been another reason why no more cases were observed.

Several medical and military reports indicated that syphilis was endemic in Laos and especially prevalent around cities and military installations. The survey team, however, had difficulty in examining all males and also in obtaining good case histories. And in the absence of a specific laboratory test, they could not obtain evidence of the prevalence of gonorrhea. Little evidence of congenital syphilis was found, although 16 villagers had saddle nose and two had Hutchinson's teeth. A total of 195, or 6.5 percent of the study people, had a positive reaction to the serologic test for syphilis, and another 529 had doubtful or weak reactions.

Bladder stones. Another disease endemic in Laos is bladder stones. It most often affects boys and seems to be caused by dietary deficiencies of animal protein and vitamin A, feeding infants glutinous rice, or drinking hard unboiled water. Twelve persons reported a history of painful voiding and the passing of sand or stones. The probable cause—not confirmed by X-ray—was bladder stones. Half of the patients were children under age 9; the others were in the 20- to 39-year age group.

Eye diseases. Using the Snellen eye chart and an intraocular, ophthalmoscopic procedure, the team examined all 2,988 survey

participants for eye disorders. They found 45 cases of blindness. Roughly two-thirds of the blind were over age 50, with a 2:1 ratio of females to males. Cataracts caused 12 cases of blindness; they were found in a range of 5 to 14 percent in every village population. Corneal opacity affected 31 persons, of whom six were blind. The team found conjunctivitis in 739 persons or 25 percent of the sample population. Pterygium occurred in every village at rates between 5 and 19 percent.

Ear diseases. Ostoscopy and auditory testing with a tuning fork helped determine hearing problems of the villagers. Although only five cases of total deafness were discovered, there were 110 cases diagnosed as acoustic loss in one ear, and 21 percent of the sample population had scarred eardrums. Team members saw many villagers cleaning their ears with sharp sticks, which may have caused some scarring of the drums. There were 52 cases of purulent discharges in the ear, and all but six of these cases were in children under 16 years of age.

Dental diseases. The team counted carious and missing teeth and checked gums for periodontal disease.

Many villagers, especially the women, had the habit of chewing betel nut, which stained both the teeth and gums; therefore examination was more difficult. Tooth decay was mild, with only 13.6 percent of the villagers having one to six carious teeth.

Periodontal disease appeared to be more serious; nearly 6 percent of the sample had a severe degree of hypertrophy, with marked recession of the gum. An additional 11 percent had a slightly less serious condition, and mild hypertrophy was observed in another 19 percent of the population.

General health conditions. During each household interview the team member asked the respondent how many days in the past year each person in the household was too ill to work or to go to school. Fifty-seven percent reported that they had not been sick; 27 percent were ill for up to 10 days; another 7 percent were ill for half to 1 month, and 3 percent reported that they were chronically ill.

Summary-Recommendations

Security is an inherent problem in implementing any health program in Laos now (1971) or in the foreseeable future. Current programs will necessarily have to be limited in scope and be extended as security permits.

Despite this major drawback there are several goals that public health officials will have to seek in Laos. The most important priority, according to survey team findings, must be given to improving environmental sanitation—especially in providing a safe water supply. Teaching key village leaders its importance may be helpful in getting a program started.

Maternal and child health is of great concern because the infant and child mortality rate is high. Clinics are needed to teach mothers what foods their children need and how to provide better general care for their infants. Intensive inoculation programs for such diseases as smallpox and typhoid must be implemented or continued.

The diets of most Laotians are seriously deficient in vitamin A, iron, riboflavin, and calcium. The maternal-child care clinics can be used to teach families the proper foods to eat, and agricultural programs should be launched to provide additional sources of meats and vegetables.

A grave possibility exists that schistosomiasis may spread from its present focal point in southern Laos into much wider geographic areas. Studies are needed to determine the snail host and geographic extent of the present infestation, with the goal of eliminating schistosomiasis from the area.

Systematic screening of village populations for persons showing early signs of leprosy should be expanded, with followup home treatment of sulfone therapy also recommended. Thus the need for leprosariums eventually could be eliminated.

Venereal diseases are found primarily in urban areas and near military installations. The best control may be periodic medical screening and treatment of military personnel and, certainly, screening and treatment for venereal diseases before discharging soldiers from military service. Manpower should be trained in midwifery and sanitation to conduct maternal-child and sanitation programs. And manpower development must be complemented by an administrative infrastructure that can support these programs both economically and technically.

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(*2*) World Health Organization: Epidemiology and control of schistosomiasis: Expert committee report. WHO Technical Report Series No. 372. Geneva, 1967, p. 12.